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ABSTRACT

As an outgrowth of a previous study by Roth and others, "Environmental Management Concepts--A List," ED 045 376, this study attempts to determine if there is significant correlation in the taxonomic ranking of selected environmental management concepts as reported by Roth and the ranking of these concepts by teachers of students in grades K-8 for the purposes of validity. Participants in the study were 31 elementary and middle school teachers attending an environmental education workshop conducted at the University of South Dakota, Summer, 1971. Six concepts were selected from each major area: (1) Environmental Management, (2) Management Techniques, (3) Economics, (4) Environmental Ecology, (5) Natural Resources, (6) The Socio-Cultural Environment, and (7) Man and the Family. Within each category the concepts were ranked by the teachers from the one they considered most important for their students to the one least important. Analyses of data indicated there was some question as to whether the national panel (who originally ordered and weighted the concepts) and the teachers were in agreement as to which concepts were most important. Also, the teachers did not agree among themselves as to which concepts were most important. The questionnaire used to gather the data is appended. (BL)

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A VALIDITY STUDY OF ENVIRONMENTAL MANAGEMENT CONCEPTS*

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An environmental education workshop for elementary and middle school teachers was conducted during the 1971 summer session at the University of South Dakota. An announcement of this offering was mailed to regional schools in South Dakota and Iowa in February, 1971, and the announced quota of 30 participants had been obtained within two weeks after the initial mailing.

This study was conducted as a part of an effort to maintain contact with the applicants during the intervening months and to gather data to aid in the development of the workshop. The materials included herein are a substudy that may be of value to environmental education curriculum developers.

Roth, Pella and Schoenfeld (1970) reported the development of a list of environmental management concepts. The report has adequately reviewed the pertinent literature and identified some of the problems of establishing environmental education concepts, particularly the artificial and maybe real semantics inconsistencies among such terms as environmental education and conservation education. It was also pointed out that previous lists of concepts and curriculum materials are agriculturally and recreationally oriented. Attepmts by Yambert (1961), Visher (1966), Hanselman (1963) and White (1967) all reported in Roth, et. al. (1970) have suggested and/or attempted to achieve a more interdisciplinary approach to environmental education curricular materials.

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The result of the study by Roth, et. al. (1970) was a taxonomy of conceptual objectives related to environmental management education for use in planning programs of instruction (K-16). The techniques employed to validate the concepts are well documented and would generally be considered as a form of construct validity. However, herein lies a significant consideration. Is the most valid procedure one that excluded the teachers that will ultimately be using curriculum materials developed around these concepts? The persons utilized for the validation procedures both in the initial Wisconsin Panel and finally a National Panel were apparently all college and/or university scholars representing 40 disciplinary areas. No mention was made of any educators in the K-12 levels as being panel members.

Purpose

This study is designed to test the validity of the environmental management concepts as determined by teachers of elementary and/or middle school students. Specifically, is there a significant correlation in the taxonomic ranking of selected environmental management concepts reported by Roth, et. al. (1970) and the ranking of these concepts by teachers of students at the K-8 level?

Sample

The sample for this study consisted of 31 teachers in the regional service area of the University of South Dakota that had indicated a desire to participate in an environmental education workshop during the Summer Session of 1971. No inference is or should be made as to the sample being random and/or representative of all teachers at the K-8 school level. However, there is no specific reason to believe they are systematically biased on a particular characteristic. Table I contains data that further describe the sample.

Table I

Selected Characteristics of the 1971 USD
Environmental Education Workshop Participants

Variable	N (Valid Cases)	Mean	S.D.
1. Grade level taught 0 = Kdg. - 8 = 8th	28	4.357	2.142
2. Number of students in class	28	26.500	11.948
3. Locale of school 1 = rural 2 = rural - small town 3 = small city 4 = large city	30	2.533	0.763
4. Distance from school to a "Natural" area (miles)	24	8.250	7.412

Procedure

From the original list of applicants for the environmental education workshop, the Environmental Education Questionnaire included in the Appendix was mailed to all applicants. No follow-up letter was necessary as 31 of 34 people that were officially notified of acceptance returned their questionnaires. An over-acceptance of four (34-30=4) was necessary to insure a total of 30 participants that would officially enroll in the workshop.

From each of the major areas, (1) Environmental Managment, (2) Management Techniques, (3) Economics, (4) Environmental Ecology, (5) Natural Resources, (6) The Socio-Cultural Environment and (7) Man and the Family, six concepts were selected to be ranked within each area as to the importance for the students of the teacher-subjects. Generally, the five highest and the one lowest weighted concept from Roth's, et. al. list was utilized on the questionnaire. The selected concepts were randomly assigned to a relative position on the questionnaire. Because of subdivisions and differential numbers of concepts, a concrete procedure using six concepts was not possible. Referral to the questionnaire and Roth's, et. al. report may be valuable to the reader.

Analyses and Results

The only source of data for the main analyses was the Environmental Education Questionnaire mentioned earlier. The variables and their corresponding numbers are described in Table II. Variables 1-4 are not described nor identified as they refer to descriptive variables and/or sorting variables that are peripheral to the main objectives of this paper.

Table II

Numbers and Descriptions of Variables

Variable Number	Variable Description
5	Grade Taught (0=Kg...8=8th)
6	Class Size
7	Locale of School 1 = Rural 2 = Rural-Small Town 3 = Small City 4 = Large City
	Environmental Management Concepts
8	Man has been a factor affecting plant and animal succession and environmental processes.
9	The management of natural resources to meet the needs of successive generations demands long-range planning.
10	Modern man affects the structure of his environment.
11	Environmental management involves the application of knowledge from many different disciplines.
12	The management of natural resources is cultural bound.
13	Esthetic resources and recreational facilities of economic and noneconomic value are becoming increasingly important in leisure-time activities.
	Management Techniques
14	Options available to future generations must not be foreclosed.

Table II (cont.)

Variable Number	Variable Description
15	Increased population mobility is changing the nature of the demands upon some resources.
16	Multiple use is a practice in which a given land area functions in two or more compatible ways.
17	Zoning is a practice in which land uses are prescribed based upon value judgements regarding the needs of society.
18	Hunting regulations are useful in maintaining and restoring populations as well as in distributing the game harvest.
19	A variety of institutionalizations is involved in planning and managing the environment.
	Economic Concepts
20	Outdoor recreation is an increasingly important part of our culture and our economy.
21	The political and economic strength of a country is, in part, dependent upon its access to domestic and foreign resources and international relationships.
22	Ready transportation, growing interest, money surpluses, and increased leisure time combine to create heavy pressures on existing recreation facilities and demands for new ones.
23	The economy of a region depends on the utilization of its natural, human and cultural resources and technologies over time.

Table II (cont.)

Variable Number	Variable Description
24	Economic efficiency does not always result in conservation of a natural resource.
25	The more efficient use of some resources is the result of technical and marketing improvements.
	Environmental Ecology Concepts
26	Most resources are vulnerable to depletion in quantity, quality or both.
27	The interaction of environmental and biological factors determines the size and range of species and populations.
28	In any environment, one component like space, water, air, or food may become a limiting factor.
29	Natural resources, water and minerals in particular, are unequally distributed with respect to land areas and political boundaries.
30	Natural resources are interdependent and the use or misuse of one will affect others.
31	Succession is the gradual and continuous replacement of one kind of plant or animal complex by another and is characterized by gradual changes in species composition.
	Natural Resource Concepts
32	The earth and life on it are greatly affected by the atmosphere.
33	As populations increase competition for the use of water increases resulting in a need for establishing water use priorities.

Table II (cont.)

Variable Number	Variable Description
34	Water is a reusable and transient resource, but the available quantity may be reduced or quality impaired.
35	Water supplies, both in quantity and quality, are important to all levels of living.
36	The amount of precipitation that becomes available for use by man varies with topography, land use, and applied management practices.
37	Soil is classified as a renewable resource, but, because it may take a few years to thousands of years to be "renewed", it is more practically termed a depletable resource.
	The Socio - Cultural Environment Concepts
38	In a democracy, a basic theory is that increasing restrictions on resources allocation and use are imposed by the consent or insistence of the people.
39	Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups and all levels of government and education.
40	Individual citizens should be stimulated to become well informed about resource issues, management procedures, and ecological principles.
41	Man has responsibility to develop an appreciation of and respect for the rights of others.
42	Knowledge of the social structures, institutions, and culture of a society must be brought to bear on environmental considerations.
43	Man has moral responsibility for his environment decisions.

Table II (cont.)

Variable Number	Variable Description
	Man and the Family
44	Man has the capability of improving society through sociology, psychology, and science.
45	Man is a high animal form because of his ability to reason.
46	An individual must develop his ability to perceive if he is to increase his awareness and develop environmental perspective.
47	Individuals perceive different self-roles depending upon their position in the social and environmental context.
48	Family planning and the limiting of family size are important if over population is to be avoided and a reasonable standard of living assured for successive generations.
49	Man performs some tasks at a high physiological cost.

The relative importance of the concepts as determined by the teachers' ranking of the six concepts in each of the seven concept areas, and the ranking of the panel in Roth's study as determined by the weighted item mean score are presented in Table III. The standard deviations for the rankings by the subjects of this study are also included in this table. Comparative standard deviations for Roth's data were not reported; however, one could derive this information from other data in his study.

The rankings of the six concepts within each of the seven major areas were correlated with the assigned ranks of the concepts utilizing Roth's "Weighted Item Score" as the basis for the ranking. Although this was not specifically done by Roth, et. al., this procedure seems completely justifiable and valid as a listing such as this inferes differential values among the taxonomic items. The procedure used in computing the correlation coefficients is the Spearman-Brown Correlation for Tied Ranks, referenced by Ferguson (1966).

Table IV contains the correlation coefficients computed as described above. It can be observed that in only one area, National Resources, is there a correlation coefficient significantly different from 0 at the .05 level.

The data in Table V describe the correlation coefficients among the teachers' highest ranked concept in each of the seven major areas. Table VI contains the coefficients obtained by correlating the teacher's ranking of the highest ranked items in each of the seven major areas by the National Panel in the Roth study. In Table V, only five of twenty-one correlation coefficients were found to be significantly different from 0 at the .05 level, and only four of twenty-one were significant at the .05 level in Table VI.

Table III

Means and Standard Deviations of Teachers' Ranking, and Weighted Item Mean Score of Roth, et. al. of Environmental Management Concepts

Concept Area	Variable Number	N	Teachers' Ranking Mean Score	S. D.	*Rank	Roth Weighted Item Mean Score	**Rank
Environmental Management	8	31	2.29	0.727	2	4.58	1
	9	31	2.94	1.46	3	4.42	2
	10	31	2.16	1.51	1	4.08	4.5
	11	31	4.20	1.06	5	4.27	3
	12	31	5.39	.83	6	2.52	6
	13	31	4.03	1.69	4	4.08	4.5
Management Techniques	14	30	3.40	1.60	3	3.51	2
	15	30	2.73	1.29	1	3.61	1
	16	30	4.00	1.67	5	3.41	5
	17	30	3.50	1.48	4	3.20	6
	18	30	2.90	1.90	2	3.43	4
	19	30	4.47	1.59	6	3.49	3

Table III (cont.)

Concept Area	Variable Number	N	Teachers' Ranking Mean Score	S. D.	*Rank	Roth Weighted Item Mean Score	**Rank
Economic	20	31	2.90	1.87	2	3.96	2
	21	31	4.13	1.52	5	3.67	5
	22	31	3.10	1.33	3	3.96	1
	23	31	2.65	1.47	1	3.79	3.5
	24	31	4.23	1.86	6	3.79	3.5
	25	31	4.00	1.37	4	2.76	6
Environmental Ecology	26	31	3.23	1.49	2	4.17	3
	27	31	4.23	1.54	5	3.84	4
	28	31	3.85	1.13	3	4.22	2
	29	31	4.71	1.80	6	3.75	5
	30	31	1.65	1.00	1	4.35	1
	31	31	3.68	1.59	4	3.03	6

Table III (cont.)

Concept Area	Variable Number	N	Teachers' Ranking Mean Score	S. D.	*Rank	Roth Weighted Item Mean Score	**Rank
Natural Resources	32	31	3.77	1.34	4	4.29	2
	33	31	3.23	.75	3	4.13	4
	34	31	3.07	1.48	2	4.17	3
	35	31	1.36	1.03	1	4.39	1
	36	31	4.77	1.38	5	3.52	5
	37	31	4.81	1.31	6	2.94	6
Socio-Cultural Environment	38	30	5.10	.94	5	2.92	6
	39	30	2.93	1.09	3	4.16	3
	40	30	3.60	1.31	4	4.29	2
	41	30	1.87	.96	1	4.38	1
	42	30	5.17	1.16	6	3.75	5
	43	30	2.33	1.32	2	3.94	4

Table III (cont.)

Concept Area	Variable Number	N	Teachers' Ranking Mean Score	S. D.	*Rank	Roth Weighted Item Mean Score	**Rank
	44	31	3.03	1.43	2	2.95	4
	45	31	3.74	2.13	5	2.83	5
Man and	46	31	2.42	1.01	1	3.63	2
the Family	47	31	3.55	1.16	4	2.99	3
	48	31	3.19	1.93	3	3.88	1
	49	31	5.07	.95	6	2.62	6

* Rank of 1 assigned to the mean score of the least value

** Rank of 1 assigned to Weighted Item Mean Score of the greatest value.

Table IV

Correlation Coefficients for Environmental Management Concepts
Between Teachers' Rankings and Roth's, et. al.,
Ranking in Each Major Area

AREA	CORRELATION COEFFICIENTS	df	REQUIRED CORRELATION FOR $p < .05$
Environmental Management	0.47	4	0.811
Management Techniques	0.49	4	0.811
Economics	0.41	4	0.811
Environmental Ecology	0.77	4	0.811
Natural Resources	0.83	4	0.811
Socio-Cultural Environment	0.71	4	0.811
Man and the Family	0.71	4	0.811

Table V

Correlation Coefficients Among the
Teachers' Highest Ranked Concept in the Major Areas

Variables	Environmental Management 10	Management Techniques 15	Economics 23	Environmental Ecology 30	Natural Resources 35	Socio-Cultural Environment 41	Man and the Family 46
10		-.263 (30)	-.295 (31)	.231 (31)	-.244 (31)	* .409 (30)	* -.363 (31)
15			* .526 (30)	-.267 (30)	.113 (30)	-.191 (30)	-.095 (30)
23				-.217 (31)	.105 (31)	.086 (30)	-.117 (31)
30					.278 (31)	.261 (30)	* .371 (31)
35						* .423 (30)	* .662 (31)
41							.090 (30)

The numbers enclosed in parentheses represent the number of subjects utilized in the correlation computations.

* $p < .05$ $.05\ r_{28} = .361$ $.05 r_{29} = .355$

Table VI

Correlation Coefficients Among
Roth's Highest Ranked Concept
in the Major Areas

Variables

	Environmental Management 8	Management Techniques 15	Economics 22	Environmental Ecology 30	Natural Resources 35	Socio-Cultural Environment 41	Man and the Family 48
8		.111 (30)	-.229 (31)	.097 (31)	.249 (31)	* .362 (30)	.029 (31)
15			-.273 (30)	-.267 (30)	.113 (30)	-.191 (30)	-.353 (30)
22				.050 (31)	.186 (31)	.207 (30)	* .409 (31)
30					.278 (31)	.261 (30)	* .421 (31)
35						* .423 (30)	.160 (31)
41							.333 (30)

The numbers enclosed in parentheses represent the number of subjects utilized in the correlation computations.

* $p < .05$ $\quad .05r_{28} = .361 \quad .05r_{29} = .355$

Conclusions

As explained earlier, the purpose of this study deals with validity considerations of a taxonomic list of environmental management concepts that were ordered and weighted according to a national panel of scholars, apparently all working in the post high school level of education. Although the competence of this panel is not questioned, this study has attempted to establish the correlation of rankings of these concepts between this panel of "experts" and a group of teachers of K-8 grade level students. A significant correlation between the rankings by the panel and the teachers would be evidence that these concepts are in fact valid and the most important for in the elementary and/or middle schools.

Based on the data and the subsequent statistical analyses, there is definitely some question as to whether the national panel and the teachers are in agreement as to which concepts are most important. The tests of the correlation coefficients in Table IV reveal that a statistical correlation at the .05 level exists only in the Natural Resources area. Granted, this is a very stringent test with only four degrees of freedom (N-2) which is appropriate, as a minimum correlation of 0.811 is required. To make it even more difficult, five of the selected concepts in each area were the highest five in Roth's taxonomic listing with a rather small variance.

It is also concluded that even the teachers, homogeneous in some ways, do not agree as to which concepts are the most important. The evidence for this conclusion is found in Table V where only six of twenty-one correlations were significant. Related to this and certainly not unexpected, the teachers did not significantly agree on the highest ranked by the National Panel.

As a general conclusion and based on the results of this study, a rather strong disagreement exists as to the relative importance of individual

environmental concepts. This disagreement exists not only between a national panel of scholars and a group of elementary and/or middle school teachers, but it also exists within this group of teachers. There is no data available to determine if this general trend of disagreement also exists among the scholars. This writer would not be at all surprised to find this to be true.

The implications of this study are important to persons responsible for environmental education curriculum. One is usually not able to include all concepts of a particular discipline for various reasons; therefore, priorities are inevitable. The question of validity should be of major concern to these developers. In keeping with the trends and practices of the elementary school science curricula, such as Science Curriculum Improvement Study, Elementary Science Study and Science-A Process Approach, it is recommended that the teachers for which the curriculum is intended should be heavily involved in the selection of the environmental management concepts to be utilized. I am not recommending that environmental education experts be uninvolved, but those directly responsible for elementary school education should be given at least equal consideration.

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APPENDIX

Name _____

Highest College degree earned _____

Grade taught (If not a teacher, explain) _____

_____

Number of students in the class you teach _____

Number of students in your school building _____

Write the number that corresponds to the locale of the building in which you teach.
(1) rural (2) rural-small town (3) small city (4) large city _____

Approximately how many miles would the students in your class have to travel to reach a "natural" area? _____

Listed below are seven sets of six concepts related to an aspect of the environment. Rank the concepts within each set from the one most important for your students to the one you consider to be least important. Assign a one (1) to the one most important and continue the ranking through each set of six until each one has been assigned a rank. (No tied ranks)

Environmental Management

		Rank
1.	Man has been a factor affecting plant and animal succession and environmental processes.	( )
2.	The management of natural resources to meet the needs of successive generations demands long-range planning.	( )
3.	Modern man affects the structure of his environment.	( )
4.	Environmental management involves the application of knowledge from many different disciplines.	( )
5.	The management of natural resources is cultural bound.	( )
6.	Esthetic resources and recreational facilities of economic and noneconomic value are becoming increasingly important in leisure-time activities.	( )

Management Techniques

		Rank
1.	Options available to future generations must not be foreclosed.	( )
2.	Increased population mobility is changing the nature of the demands upon some resources.	( )

		Rank
3.	Multiple use is a practice in which a given land area functions in two or more compatible ways.	( )
4.	Zoning is a practice in which land uses are prescribed based upon value judgements regarding the needs of society.	( )
5.	Hunting regulations are useful in maintaining and restoring populations as well as in distributing the game harvest.	( )
6.	A variety of institutional is involved in planning and managing the environment.	( )

Economics

		Rank
1.	Outdoor recreation is an increasingly important part of our culture and our economy.	( )
2.	The political and economic strength of a country is, in part, dependent upon its access to domestic and foreign resources and international relationships.	( )
3.	Ready transportation, growing interest, money surpluses, and increased leisure time combine to create heavy pressures on existing recreation facilities and demands for new ones.	( )
4.	The economy of a region depends on the utilization of its natural, human, and cultural resources and technologies over time.	( )
5.	Economic efficiency does not always result in conservation of a natural resource.	( )
6.	The more efficient use of some resources is the result of technical and marketing improvements.	( )

Environmental Ecology

		Rank
1.	Most resources are vulnerable to depletion in quantity, quality or both.	( )
2.	The interaction of environmental and biological factors determines the size and range of species and populations.	( )
3.	In any environment, one component like space, water, air, or food may become limiting factor.	( )
4.	Natural resources, water and minerals in particular, are unequally distributed with respect to land areas and political boundaries.	( )
5.	Natural resources are interdependent and the use or misuse of one will affect others.	( )

		Rank
6.	Succession is the gradual and continuous replacement of one kind of plant or animal complex by another and is characterized by gradual changes in species composition.	( )

Natural Resources

		Rank
1.	The earth and life on it are greatly affected by the atmosphere.	( )
2.	As populations increase competition for the use of water increases resulting in a need for establishing water use priorities.	( )
3.	Water is a reusable and transient resource, but the available quantity may be reduced or quality impaired.	( )
4.	Water supplies, both in quantity and quality, are important to all levels of living.	( )
5.	The amount of precipitation that becomes available for use by man varies with topography, land use, and applied management practices.	( )
6.	Soil is classified as a renewable resource, but, because it may take a few years to thousands of years to be "renewed," it is more practically termed a depletable resource.	( )

The Socio - Cultural Environment

		Rank
1.	In a democracy, a basic theory is that increasing restrictions on resources allocation and use are imposed by the consent or insistence of the people.	( )
2.	Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups and all levels of government and education.	( )
3.	Indivdiual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles.	( )
4.	Man has responsibility to develop an appreciation of and respect for the rights of others.	( )
5.	Knowledge of the social structures, institutions, and culture of a society must be brought to bear on environmental considerations.	( )
6.	Man has moral responsibility for his environmental decisions.	( )

Man and the Family

		Rank
1.	Man has the capibility of improving society through sociology, psychology, and science.	( )

Rank

2. Man is a high animal form because of his ability to reason. ( )

3. An individual must develop his ability to perceive if he is to increase his awareness and develop environmental perspective. ( )

4. Individuals perceive different self-roles depending upon their position in the social and environmental context. ( )

5. Family planning and the limiting of family size are important if over population is to be avoided and a reasonable standard of living assured for successive generations. ( )

6. Man performs some tasks at a high physiological cost. ( )